DEVELOP A WELLHEAD PROTECTION PROGRAM

Grades 10-12

OBJECTIVES

- Learn about the tools communities may use to develop a wellhead protection program.
- Recognize that developing a community wellhead protection program is not easy and that, while it is important to protect drinking water supplies, it can be very difficult to develop a program that will gain support from the overall community.

INTERDISCIPLINARY SKILLS

English, Political Science, Law

ESTIMATED TIME

Two to three class periods

MATERIALS

- ❑ Activity handout
- ❑ "Protecting the Town Well Takes Some Doing"

TEACHING STRATEGY

In this activity, students will develop a wellhead protection program for a hypothetical community. While the community scenario is hypothetical, it is representative of situations that many New England communities face when embarking on a wellhead protection program. You may choose to have the students undertake this activity as a class or as teams. Students should read "Getting Up to Speed…Protecting Ground Water" before beginning this activity.

We recommend that you have students assume various roles in the community (e.g., gas station owner, photo lab owner or employee, beauty salon owner, restaurant owner, resident, environmentalist). In doing this, each student can bring the perspective of his or her role to the discussion. You may wish to point out that the relationships between businesses, environmentalists, and community leaders can be, but need not be, adversarial. Many businesses have taken pollution prevention to heart as a way of reducing supply costs, waste disposal costs, insurance costs, reducing regulatory paperwork, and being a good neighbor.

1. Distribute copies of the activity handouts and the reading.
2. Tell the students that they are residents of "Small Town" and are members of the town's Ground Water Protection Committee, which is about to begin developing a wellhead protection program for the community's public supply well. Students should keep in mind that this wellhead protection program must ultimately gain the support of the community as a whole to be effective.

   Explain to the students that there is no "correct way" to protect a community's wells. Developing a best management program is dependent on the unique situation and limits (political, financial, physical, administrative) faced by the community. There really are no right or wrong answers in this exercise. As a homework assignment, have the class read the activity handout, the reading, and "Getting Up to Speed."
3. Hold a committee (class) meeting to discuss the information provided by the consulting firm hired by the Ground Water Protection Committee (as per the activity handout) and the considerations associated with developing a wellhead protection strategy—the area to be protected, potential threats to ground water, types of protection mechanisms, political and economic environment.

   As part of this meeting, answer the three questions posed in the handout:

NOTES

a. Does existing development in the wellhead protection area pose a threat to the town's well? If so, how?

Many land uses have the potential to jeopardize ground water quality. Ground water quality can be threatened by the improper use, handling, or storage of hazardous materials and the improper use of lawn and agricultural fertilizers and pesticides. Land uses where hazardous materials are typically used, such as gas stations and auto repair shops, pose an especially high risk of contamination because of the potential for repeated spills during their daily operation. Ground water availability can be strained because of excessive water use, particularly during periods of drought. Uses such as restaurants and hospitals tend to use large amounts of water. Watering of lawns and gardens during summer months without sufficient recharge (caused by drought or over withdrawal) places especially high demands on ground water supplies.

b. What, if anything, should be done to protect the town's well?

In this scenario, the town's drinking water supply is at risk from potential sources of contamination. Ideally, the town should work to minimize potential risks from existing and future land uses in the wellhead protection area in particular, and town wide, in general. Students should be familiar with information in "Getting Up to Speed…Protecting Ground Water" to gain some insight on steps communities can take to protect their water resources.

c. How can the town ensure that current and future land uses in the wellhead protection area will not present a threat to the well?

There is no way for any community to ensure that current and future land uses in its wellhead protection area(s) will be risk-free—accidents and carelessness happen. Communities do, however, have many tools available to them to reduce the risk of contamination. Refer to "Getting Up to Speed…Protecting Ground Water" and the reading for this section.

4. Based on the Ground Water Protection Committee's discussion, have the class or each team prepare a wellhead protection strategy for presentation at town meeting. Encourage students to think creatively. There are no right or wrong answers. When developing a protection strategy, communities must balance environmental protection with other goals, such as economic sustainability and quality of life, and must consider the political feasibility of gaining acceptance of the strategy. A plan is only worthwhile if it can be carried out.

5. If the activity is carried out by teams, ask each team to present its findings to the class. Students should assume the roles of various members of the community (e.g., business owners, landowners, homeowners) so that the committee hears many viewpoints.

Develop a Wellhead Protection Program

▶ Directions

Read the following scenario:

▶ Setting

You are a resident of "Small Town" and a representative of the town's Ground Water Protection Committee. Like many small towns in the United States, your town developed along a historic travel route. A well was installed approximately 30 years ago to serve the downtown area and a nearby residential neighborhood in the town.

▶ Action

Because of recent incidents of ground water contamination in a neighboring community, your community hired a firm to identify (or delineate) the land area that supplies water to your well. This land area is called the wellhead protection area.

▶ Existing Conditions

At the last Ground Water Protection Committee meeting, the firm presented its findings. Your committee learned that most of the downtown area is located in the wellhead protection area. (See attached land-use and zoning maps.)

- A range of land uses exists throughout the wellhead protection area, including:
  - Gas station
  - Photo lab
  - Restaurant
  - Hospital
  - Farm
  - Houses (sewered)
- Land uses located nearby but outside the wellhead protection area include:
  - Houses
  - Plastics manufacturing plant
  - Clothing store

▶ Your Job

ASSIGNMENT

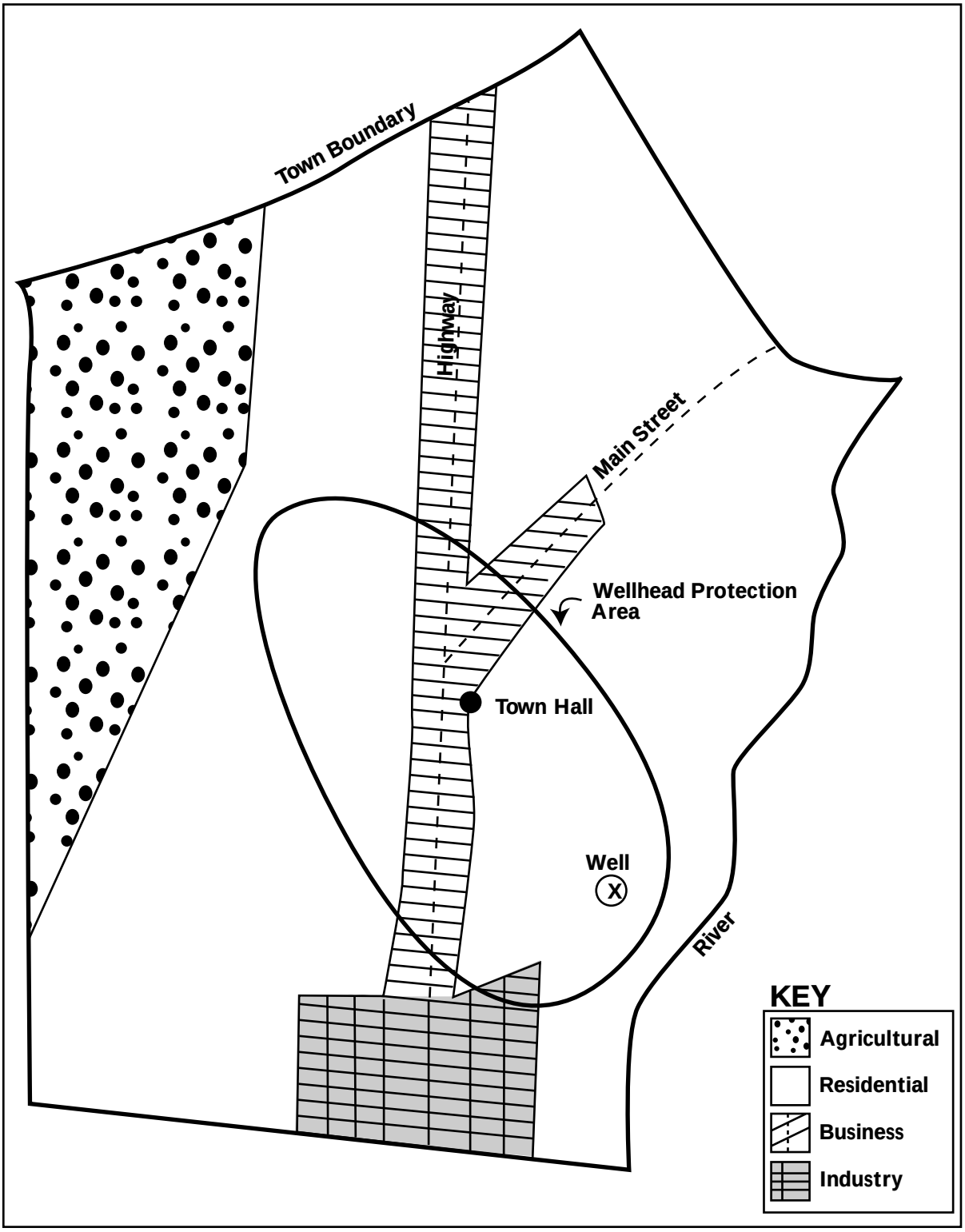
The Ground Water Protection Committee is meeting tonight to discuss the firm's findings. Tonight you will discuss three key questions and begin developing a wellhead protection plan.

Ground Water Protection Committee Agenda

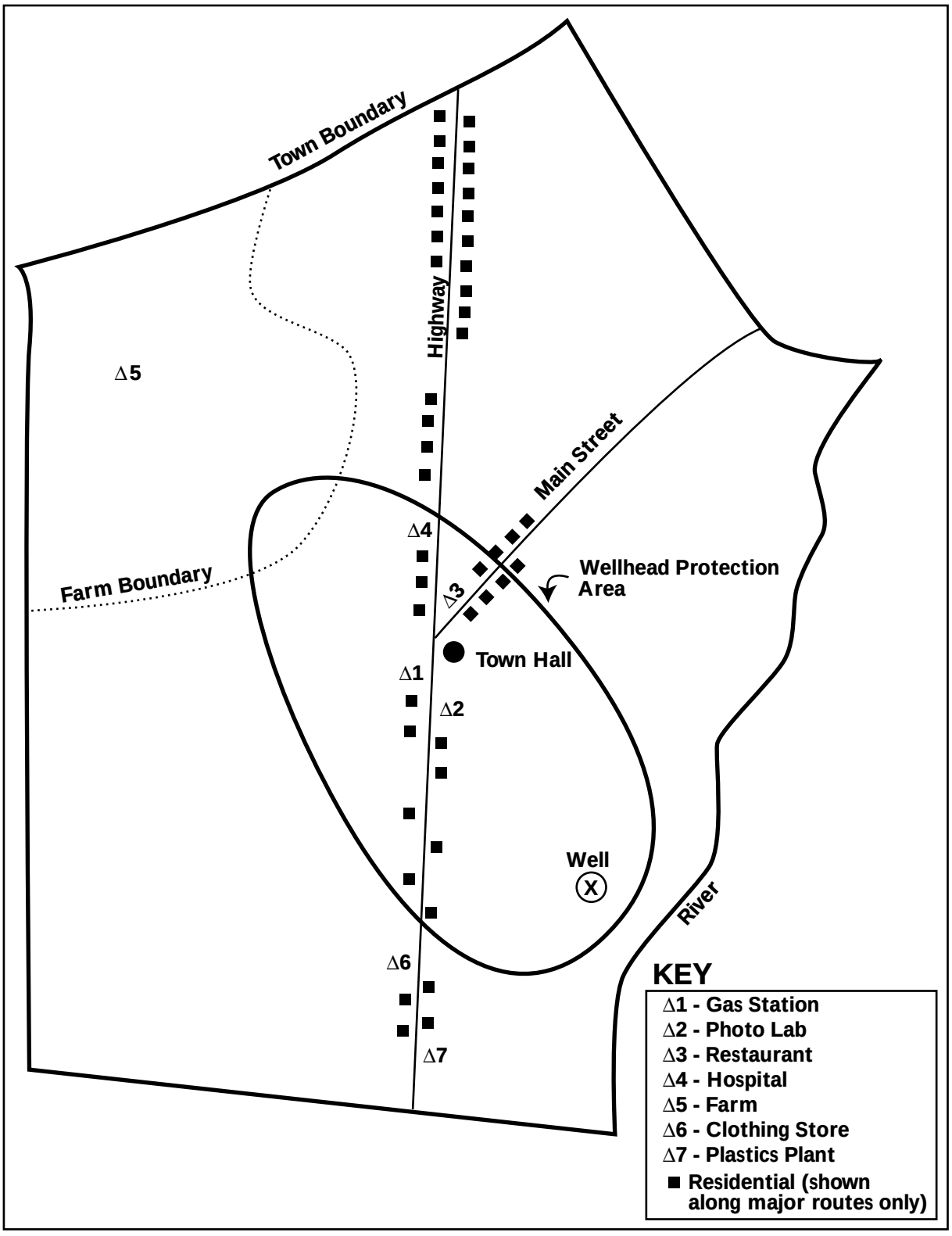
_____, 19___

1. **Introductions**
2. **The Committee will discuss the consultant's findings and will attempt to answer three major questions:**
   - Does existing development in the wellhead protection area pose a threat to the town's well? If so, how?
   - What, if anything, should be done to protect the well?
   - How can the town ensure that current and future land uses in the wellhead protection area will not present a threat to the well?
3. **The Committee will begin development of a wellhead protection program for the well, in light of the consultant's findings and the answers to the above questions.**

Small Town Zoning Map



Small Town Land-Use Map



CLINTON WATER DISTRICT, CLINTON, MAINE

Protecting The Town Well Takes Some Doing

Is it worth losing your best friend to protect the town well? Just ask Ron Boivin, Water Superintendent for the Town of Clinton, Maine, who faced this question when his town attempted to implement wellhead protection measures to protect the town's only well. Located in Kennebec County amid gently rolling hills at the confluence of the Kennebec and Sebasticook Rivers, this tranquil dairy farming community of 3,350 in south central Maine has the highest number of active dairy farms of any town in the state.

A few years back, nitrates detected in ground and surface waters alarmed many residents, who began to suspect that local farming activities were to blame. The town had relied on a single well since 1946 for its drinking water supply. Discussion of protecting the land above this aquifer raised a number of land use issues, which frightened many of the town's farmers—Boivin's best friend among them.

"I was scared to death when this project started," says Boivin, who didn't know how his fellow town residents would react to the idea of imposing certain restrictions to protect the town's water supply. The Tapley Well, which supplies 100,000 gallon per day, is located in a partially developed downtown area.

"My best friend owns the farm that we originally thought was causing the nitrate levels in the water," Boivin explains. With no backup well online in the event of contamination, town officials were coming to realize that a second well was needed.

A Chance Meeting

While attending a Maine Water Works conventio in Portland in 1991, Boivin met Peter Garrett, a principal in the firm of Emery and Garrett Groundwater Inc., a hydrogeological consulting firm located in Waterville - the next town over from Clinton. Garrett was familiar with Maine's new EPA-approved Wellhead Protection Program, and was looking for an opportunity to apply it on the local level.

After listening to Boivin's concerns about protecting the town's water supply, Garrett suggested to Boivin that Clinton apply to a new EPA grant program for funds to study and map the wellhead protection area—the area of land that recharges the well. Inexperienced in the often-daunting process of filling out federal grant applications, Boivin convinced the town that their money would be well spent to hire Garrett to do it for them.

Garrett, in turn, made a convincing case to town officials that the most logical process for Clinton to follow would be to conduct a hydrogeological study of the existing well to determine the extent of land that needed to be protected before addressing the installation of a backup well.

EPA Awards Demonstration Grant

Garrett teamed up with Esther Lacognata, an environmental policy consultant, to prepare the grant application. Lacognata was a former Bureau Director in Maine's Department of Agriculture, and also had extensive experience in public participation and agricultural issues.

Garrett and Lacognata both felt that the grant application should focus on two primary principles of wellhead protection: demonstration of how to induce farmers to adopt Best Management Practices (BMPs) in public water supply watersheds; and emphasis on the importance of citizen involvement through the formation of an advisory committee.

In 1991, EPA awarded the Clinton Water District a $15,200 grant to develop a wellhead protection project that would consist of delineating the zone of contribution; identifying and proposing management options to control threats to ground water quality; and preparing a contingency plan in the event of contamination.

The consultant team was also hired to assemble an Aquifer Protection Advisory Committee that would provide input and oversee the plan. With strong leadership from the town's Selectmen and the Water District, the Town of Clinton contributed $18,250 to the project - a substantially higher sum than the minimum 5 percent match that EPA required for the grant.

The Advisory Committee Is Assembled

With dairy farmers accounting for almost half the land ownership in Clinton, both Garrett and Lacognata knew that the farmers' support was critical if the wellhead program was to have any chance of success. Garrett also recognized the importance of using Lacognata's public participation skills to help explain highly technical issues to the public, because, as he says, "many of the people who can do the technical work are often not very good at explaining it."

Source: NEIWPCC. *The Water Source.* Fall 1994.

Protecting the Town Well Takes Some Doing *continued*

It took some measure of persuasion to convince local water officials that a citizen's advisory committee, which would have substantial input into the wellhead protection plan, would be a good idea. One of the first tasks Lacognata tackled was to assist local officials in determining who should comprise the 10-to 12- member Aquifer Protection Advisory Committee.

To avoid the inevitable political squabbles that often arise in local government, Lacognata "pre-interviewed" members of the local water district and the comprehensive planning committee to seek their input on membership. The final Aquifer Protection Advisory Committee consisted of members of Water District staff, the Comprehensive Planning Committee, the Planning Board, local historians, business owners, and farmers.

Hydrogeological Study Yields Some Surprises

While Lacognata focused on generating public support for the project, Peter Garrett got to work conducting water sampling and pump tests to determine the direction and source of water supplying the well. At the time, Clinton was using a 300-foot fixed radius as a zone of protection around the well. However, Garrett knew from experience that a fixed radius bears little relation to what is actually happening beneath the surface. Poring over state maps that showed the well to be located in a shallow sand and gravel deposit, Garrett initially believed that the aquifer was too small to be supplying such a large amount of water. This concern lead him to believe that the two streams located on either side of the well were actually recharging the aquifer through a process known as induced filtration.

After reviewing the data, the recharge rates, and old pump test yields from the 1940s, Garrett surmised that the streams must have, at one time, supplied recharge to the aquifer. Old pump tests revealed that, indeed, more water had been pumped in the 1940s.

After much head scratching, Garrett observed that the stream bottoms were heavily silted over, probably as a result of changing crops over from hay to corn (plowing associated with corn crops loosens the soil and increases erosion runoff) in the 1950s. This siltation suggested that, at present, very little water was infiltrating the streambed. Also, water samples from both the well and the streams indicated differences in hardness, which, as Garrett hypothesized, "seemed to fit a model that would suggest that the water came from bedrock fractures."

With data in hand, Garrett mapped out a Primary and Secondary Wellhead Protection District that, much to the relief of area farmers, did not include their farms. The Primary District was the immediate area of drawdown around the well (called the cone of influence). The Secondary District, consisting of 638 acres, comprised the recharge area.

It is ironic to note that, although farming activities did not appear to be threatening the wellfield, the farm community did find itself subject to changes in farming practices. A state law, which was being implemented at the same time that the wellhead protection project was underway, required minimum setbacks from streams and other water sources. Best management practices, such as manure holding tanks, pesticides application controls, and riparian preservation corridors, are currently being implemented by farmers statewide.

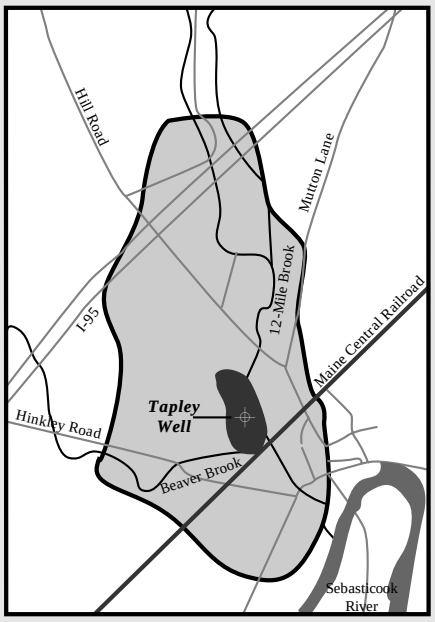
The Public In The Process

The first public meeting of the newly formed Aquifer Protection Advisory Committee attracted many farmers who were, according to Lacognata, "absolutely terrified" that the wellhead protection plan would impose new regulations and land use controls over their activities. "The first meeting was educational and confirmatory," says Lacognata. "Peter Garrett and I used a mock question and answer session to address the farmers concerns about what this would mean to them."

This question and answer technique had been used successfully by Garrett on other occasions to help take the pressure off the audience. By having Lacognata, who was not a hydrogeologist by training, ask Garrett to explain basic concepts that the audience might have been reluctant to ask, they created a more relaxed atmosphere at the meeting, which in turn facilitated discussion.

Other activities intended to

Primary and Secondary Wellhead Protection Districts for Clinton's Tapley Well



Protecting the Town Well Takes Some Doing ***continued***

further public support for the project included a field trip to the pump station and monitoring well; a demonstration of a pump test; visual aids; and a demonstration by Garrett on how he had calculated the size of the wellhead protection area.

A New Wellhead Protection Ordinance

Enter Paula Thompson and Ron Cormier. Thompson, at the time a Senior Planner with the North Kennebec Regional Planning Commission, began to work with the Advisory Committee on developing a wellhead protection ordinance. Fortunately, Clinton had completed a Comprehensive Plan (a requirement of Maine's Growth Management Act) in 1989 that specifically required the town to address ground water and public water supply issues. A section in the new Land Use Ordinance was set aside for wellhead protection.

Working with the Planning Board, Thompson, and the Advisory Committee, Code Enforcement Officer, Ron Cormier set out to design an ordinance that was tailored specifically to the needs of Clinton. Using model ordinances from other states as a starting point for discussion, the group eventually proposed an overlay district that would prohibit certain high risk activities within the wellhead protection area.

With input from town officials and the public, the ordinance was tailored to give landowners considering activities in the wellhead protection area two options: to rebut the presumption of the boundary of the wellhead protection area, or to adhere to the performance standards that were developed for certain uses.

In the case of a challenge to the boundary, the burden of proof would fall on the landowner or developer to show that the intended activity within the Secondary Wellhead Protection District would not adversely impact the well. To overcome this presumption, a landowner would have to hire a hydrogeological consultant, whose work would also be reviewed by the Water District's hydrogeological consultant, to conduct in-depth studies to make their case.

Flexibility The Key To Success

By offering some flexibility in terms of what uses would be allowed in the Secondary Recharge Area, the town felt that opponents to the plan would have fewer grounds on which to object. According to Cormier, the ordinance process allows a landowner to work with town officials in a reasonable manner to determine if their intended use will impact the well. "Give us your plan, we'll talk about it," says Cormier.

Lacognata also agrees that flexibility was key to obtaining public support for the project. "We did design the ordinance for Clinton and it's conditions. Therefore, it may be more permissive than it might be someplace else," she explains.

Lessons Learned

Despite a current challenge to the wellhead ordinance by a local landowner, the participants have all felt that the Clinton project was successful in many respects. Ron Boivin found out that even highly technical subjects like wellhead protection can be made understandable. "If you explain it to people in language they understand, they react much better," he says.

The farming community, who initially balked at any talk of land use controls to protect the town's drinking water, also learned that the public participation process was an effective forum for airing their concerns and for understanding the issues.

Ron Cormier feels that 40 years in the land development business has taught him the critical importance of protecting municipal water supplies. "No water, no town. It's that simple," he says. He also credited the success of the project to strong leadership by the Planning Board and Selectmen, who made the decision to spend money on prevention activities to protect the long term interests of the town.

Peter Garrett feels that the true value of wellhead protection is "not simply arriving at a drawn line around a well." Rather, he says, information about the safe yield, water quality, thickness of the aquifer, and other data will allow for more intelligent and informed decision making.

The Clinton experience has reinforced Esther Lacognata's belief that wellhead protection is essentially a locally-based activity. "Wellhead protection cannot be forced from the top," she says. The project has also confirmed for her that the public needs to understand the "fundamental relationship between land use, water quality, and the need for sound scientific information as a basis for management decisions."

Paula Thompson says the Clinton project has taught her that you can't "overcommunicate" between parties. With continual turnover of local officials, many of whom are volunteers, the entire wellhead program and ordinance is but "one town vote away" from elimination. She stresses the need for a support system that both ensures continuity of understanding and intent and sustains the momentum evident at the beginning of the project. •